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(54) BACTERIOLOGICAL TESTING APPARATUS

(71) I, JOHN T. BENNETT, JR., a Citizen of United States of America, of 18025 Lafayette Drive, Olney, Maryland, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention is directed to a biological testing apparatus and more specifically to an apparatus for simultaneously transferring a plurality of individual drops of liquid from a common trough to a plurality of individual spaced apart cavities for testing purposes.

It is old and well known in the art to provide a plate having a plurality of dispensing prongs spaced thereon in a predetermined pattern and a container having a plurality of holes or wells spaced therein in the same predetermined pattern. However, such prior art dispensers did not provide any control whatsoever for the extent of penetration of the dispensing prongs into the holes. Furthermore, it was never contemplated to use the plate upon which the prongs were mounted as a cover for either a common supply of liquid or a cover for the container having a plurality of holes therein since the prongs depending from the plate were many times longer than the depth of the holes.

Other prior art devices contemplated the use of a tray having a cover adapted to fit thereon in a predetermined relation with a plurality of prongs depending from the underside of the cover a predetermined distance into the tray. Quantities of different metabolic agents were applied to the prongs in various ways for insertion into a common culture medium in the tray. Thus, the separation of the cultures during a culture study was achieved solely by the spacing of the prongs and separate individual cavities were not provided for each culture growth.

Another bacteriological titration arrangement utilized two identical trays each having a plurality of individual cavities formed therein in identical spaced apart relation. One tray was adapted to fit on top of the other with the cavities of the one tray disposed directly over the cavities of the other tray. Upon puncturing the bottom of the cavity in the upper tray the fluid therein could be forced by air pressure through the puncture into the cavity directly therebeneath thus eliminating the need for fluid transfer prongs.

The present invention provides a bacteriological testing apparatus which provides a convenient and economical arrangement for simultaneously transferring a plurality of individual drops of liquid from a common tray to respective individual cavities in a second tray.

The present invention provides a bacteriological testing apparatus wherein a common cover and fluid transfer member is provided which will cooperate with trays having identical external dimensions and fluid compartments of equal depth to accurately control the relation of the fluid transfer member to the liquid in the compartments.

The present invention provides a bacteriological testing apparatus comprised of first and second substantially rectilinear trays having identical external dimensions including an outwardly extending flange about the periphery of the base of each tray and a cover member having a plurality of depending prongs spaced apart in a predetermined pattern on the under surface thereof and a depending peripheral flange adapted to cooperate with the flange on a respective tray to accurately position the prongs relative to each tray and at the same time keeping the under surface from which the prongs extend from contacting the top surface of the trays, said first tray having a single substantially rectilinear fluid receiving trough and said second tray having a plurality of individual cavities having a depth equal to the depth of said trough and being spaced in a predetermined pattern identical to the spacing of said prongs. The end of each prong may be roughened and/or provided with a concave cavity to facilitate the transfer of a drop of liquid from one tray to the other. The side walls of each tray and the depending flange on said cover slope outwardly to provide a good fit between the

cover and each tray so that the liquid in the trough of the first tray must be protected by the cover until such time as it is desired to transfer a plurality of drops of liquid to the cavities of the second tray and thereafter either provide protection for the culture growth in each cavity by means of the same cover member which was used to inoculate the substance in each cavity of the second tray or be returned to the first tray for safe disposal of its contents if other means of sealing the second tray are used.

In addition, both trays have keyed female slots or narrow openings in their vertical outside walls which mate with male keys in the inside surfaces of the vertical walls of the cover that aid in the proper orientation of its prongs before the cover can be seated on the trays, thereby helping to avoid the prongs and their liquid drops from contacting the top surfaces of the trays.

In the drawings:

Figure 1 is an exploded view of the cover and first tray having the common trough with portions of the cover broken away to expose the fluid transfer prongs;

Figure 2 is a sectional view of the cover and tray of Figure 1 along the lines 2—2;

Figure 3 is a view similar to Figure 1 showing the cover and second tray having the individual cavities in spaced apart relation;

Figure 4 is a sectional view of the cover and second tray taken along the lines 4—4 of Figure 3; and

Figure 5 is a partial sectional view of the cover and fluid transfer prongs showing the detail thereof.

In Figures 1 and 2, the cover 10 is illustrated in spaced relation to a first tray member 20. The cover 10 is provided with a flat rectangular upper surface 12 and four depending side walls 14 which slope outwardly as best seen in Figure 2. A plurality of identical prongs 16 extend downwardly from the upper surface 12 and the lower end of each prong is formed with a concave recess 18 to facilitate the transfer of a single drop of liquid on the tip of the prong after the prongs have been dipped into a liquid supply. Each of the prongs 16 are spaced from each other in a predetermined pattern. According to the present example, a total of thirty-two prongs 16 are provided in four rows with eight prongs in each row so that the prongs will be equally spaced from each other in a rectangular pattern.

The tray 20 is provided with a flat rectangular upper surface 22 with four side walls 24 depending therefrom and sloped outwardly as best seen in Figure 2. A peripheral flange 26 extends completely about the lower edge of the four walls 24 and the center portion of the upper surface 22 is provided with a rectangular depression or trough 28. The rectangular trough 28 is sized so as to receive the rectangular array of prongs 16 which depend from the upper surface of the cover 10. The slope of the side walls 24 of the tray 20 match the slope of the side walls 14 of the cover 10 so that the cover 10 will fit easily, yet closely, over the tray 20. The bottom edges of the side walls 14 of the cover 10 rest on the flange 26 so that the ends of the prongs 16 will be spaced in close proximity to the bottom of the trough 28.

The second tray 30 is dimensioned identical to the first tray 20 insofar as the length, width and height of the tray is concerned. The tray 30 is provided with a flat upper surface 32 downwardly and outwardly sloping side walls 34 and a peripheral flange 36 disposed about the lower edge of the side walls. The upper surface 32 of the second tray 30 is provided with a plurality of cavities 38 which are disposed in an array identical to the array of prongs 16 so that when the cover 10 is fitted over the second tray 30 with the lower edge of the side walls 14 resting on the flange 36, the prongs 16 will each be disposed in a respective cavity 38 with the lower ends of the prongs spaced in close proximity to the bottom of the cavities. The depth of the cavities 38 is identical to the depth of the trough 28 in the first tray 20. The cover 10 is provided with a plurality of keys 40 and each tray 20 and 30 is provided with complementary grooves in the side walls so that the cover will only fit on a specific orientation.

Each of the three components of the testing kit can be formed of any suitable plastic material, such as polystyrene or the like, and the thickness of the plastic need only be great enough to impart some shape retaining rigidity to the various components. Thus, the three components of the kit can be produced rather inexpensively so that the kit can be disposed of after a single use. By providing the three components with identically sloping side walls, the three components can be nested and enclosed in an overwrap to maintain the sterile condition of the components prior to use. In the nested arrangement, the cover 10 can fit completely over the first tray 20 and the first tray 20 can be partially nested over the second tray 30 inasmuch as the depth of the trough 28 is less than the overall height of the tray 20.

In use, the trough 28 in the tray 20 would contain a bacterial culture medium. By placing the cover 10 over the first tray 20 so that the lower edges of the side walls 14 rest on the flange 26, the prongs 16 will dip down into the bacterial culture medium. As the cover is lifted, a drop of the bacterial culture medium will be carried by each projection or prong for transfer to the individual cavities of the microtiter tray 30 which have been previously filled with a specified

amount of biological testing medium. Although it is possible to construct the three components of the testing kit from a material which can withstand repeated autoclaving for reuse, it is preferred to produce the components by an inexpensive injection molding process and gas sterilize the components initially so that they can be disposed of after use, thereby avoiding any possible contamination of subsequent testing operations. The present construction of the components according to the present invention also provides additional safety for the user in handling dangerous bacterial growths. The sides of the cover protect the user from coming into contact with the pick-up prongs and the growth carried thereby. As mentioned previously, the lower end of each prong is provided with a concave recess to assist in holding a drop of the growth on the end of the prong. The ends of the prongs could also be roughened to aid in holding a drop of fluid thereon.

It is also possible to compartmentalize the trough 20 by adding vertical cross members so that more of the medium may be transferred simultaneously by the respective prongs that correspond to the compartment.

WHAT I CLAIM IS:—

1. A bacteriological testing kit comprising a cover member having a flat upper surface, downwardly and outwardly depending side walls and a plurality of fluid transfer prongs depending downwardly from said upper surface within said side walls, said prongs being substantially shorter than said side walls, a first tray having a flat upper surface, downwardly and outwardly depending side walls, outwardly extending flange means about the lower edges of said side walls and means defining at least one trough in said upper surface adapted to receive the plurality of prongs of the cover member and a second tray having a flat upper surface, downwardly and outwardly depending side walls, outwardly extending flange means extending about the lower periphery of said side walls and means defining a plurality of individual cavities in the upper surface of said second tray disposed in a pattern identical to the pattern of the prongs on the cover, the external dimensions of said cover member and said first and second tray members being identical to permit nesting of said members during shipment and to permit said cover member to be placed on either of said first and second tray members with the lower edge of the side walls of the cover member resting on said flange means to accurately position said prongs relative to said trough and said cavities, said cover member and said first and second tray means having complementary keys and grooves to permit only a single orientation of said cover means with respect to said first and second tray means and to ensure alignment of said prongs with said trough in said first tray or said cavities in said second tray as said cover is being placed on said trays before said prongs enter into said trough or said cavities.

2. A bacteriological testing kit as set forth in claim 1 wherein said first and second tray means and said cover means are formed from a plastic material.

3. A bacteriological testing kit substantially as hereinbefore described with reference to the accompanying drawings.

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1522128 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG.1

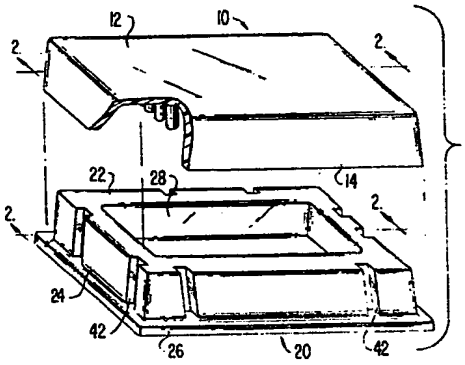

FIG.2

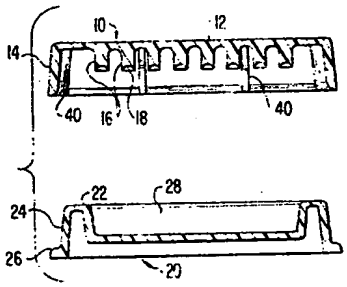

FIG 3

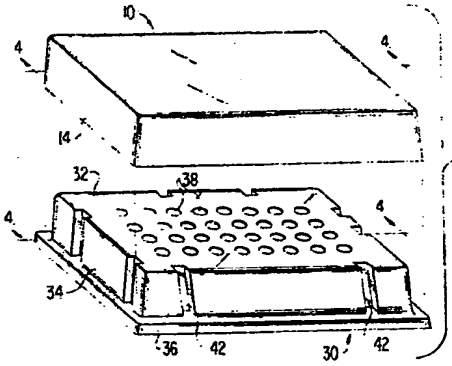

FIG 4

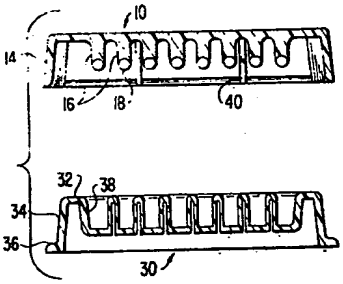

FIG.5